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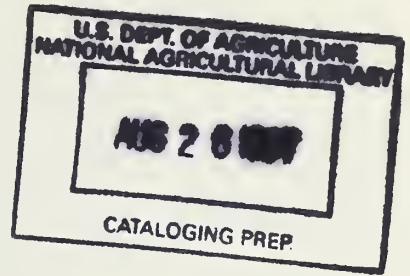
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Service-wide Telecommunication Study
Study Plan

U. S. Department of Agriculture
Forest Service

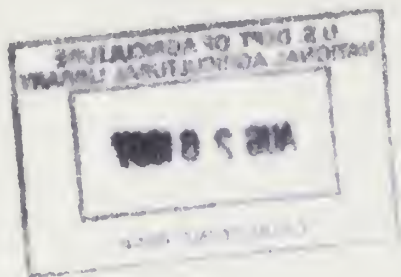


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Purpose of Study

A. The study will evaluate the management of the radio systems needed to satisfy the communication requirements of present and future Forest Service programs. It will provide methodologies and recommendations for evaluating requirements, financing procedures, and organizational structures for communication management. Alternate non-radio communication systems will be taken into account.

B. The study will concurrently provide solutions to some critical large-fire communication problems.

Problem Statement

An earlier Forest Service Communication Study Task Force, which met in the Washington Office during July of 1968, identified the following problem areas in the present overall communication program:

1. Weakness in procedures for objectively evaluating communication requirements
2. Lack of adequate systems standards
3. Recruitment and training problem
4. Lack of information exchange between line management technical services and the functional staff concerning communication management.

In addition to the overall problem areas, specific large fire communication problems were identified by Fire Control on the basis of questionnaire responses and other inquiries in the areas of air attack, intra-sector and service function communications.

The study objectives of the present Telecommunication Study were established in March of 1970, on the basis of the enumerated problem areas and the study objectives delineated by the earlier task force (see Appendix).

Study Objectives

A. New Systems and Technologies

1. Provide descriptive outline of new technological and systems possibilities applicable to present and projected communication needs of Forest Service programs.

B. Communication Management

1. Provide methods for evaluating present and future communication needs for all Forest Service Programs and for evaluating alternate means of satisfying them.
2. Develop and recommend standardization policies, guidelines, and/or specific standards, when appropriate, for:
 - a. Operating characteristics of systems and operational procedures.
 - b. Replacement, maintenance, and installation of hardware and general hardware quality requirements.
 - c. Planning procedures and policy.

3. Recommend financing procedures for communications systems considering:
 - a. Methods for providing communications services:
 - (1) Purchase
 - (2) Lease
 - (3) Subscription
 - b. Methods for financing:
 - (1) Fire and general purpose
 - (2) Working Capital Fund
 - (3) Congressional line item
 - (4) Multi-function
 - (5) General operating expense
 - (6) Other methods
 - c. Internal allocation of funds
 - (1) Among administrative units (Regions, Forests, etc.)
 - (2) Among systems (air net, zone systems, etc.)
 - (3) Between purchase and maintenance
4. Recommend organizational structures and policies for the management, installation, maintenance, and operation of communications systems.
 - a. Engineering and maintenance organizational alternatives
 - b. Organizational ties and lines of communication with other parts of the Forest Service organization

- c. Recruitment and training
- 5. Provide a communication management system
- C. Large Fire Communications
 - 1. Provide solutions to general communication problems related to large fires, with special focus on:
 - a. Intra-sector communications
 - b. Air attack communications
 - c. Service function communications

Values to be Considered in Study

Personnel safety

Maximizing benefits

Resource management

Organizational management effectiveness

Minimizing costs

Investment

Operations

Loss of resource

Convenience

Study Procedures and Methodologies

The study group may recommend contracting any portion of the study whenever such action appears necessary or desirable to accomplish the study objectives. The study group may also call on Forest Service personnel as consultants when needed. The use of one or more of the procedures and methodologies shown is foreseen:

Expert opinion
Subjective user evaluations
Cost benefit studies
Stochastic models of network operations
Simulation of communications systems
Trend analyses and projections
Historical analyses and evaluations
Study of applicable regulations
Comparative studies (from literature)
Evaluation of overrides

Data Gathering Needs and Procedures

The data needed for the completion of the objectives of this study will be determined by the respective study groups. This will be done at the earliest possible time to avoid delays in the study. Data gathering should be coordinated (with the study group members and the Review Committee) to obtain the most widespread participation in study inputs and to avoid undue impact on field personnel.

The foreseen methods of data gathering will be one or more of the following:

Observation and recording in the field

Personal interview

Mail questionnaire

Compilation from records

Inference from other data (by means of models, simulation techniques, etc.)

Nature of Study Outputs

Study Objective

A1	Descriptive
B1	Methodologies and/or recommendations based on specific findings
B2, 3, and 4	Specific recommendations
B5	Management system
C1	Specific findings and solutions

Study Participants

A. Study Team

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Study Tasks Assignment

Objectives	Team Members										
	JC	LH	TH	MH	JJ	BK	FM	BM	GS	KS	EV
A1			(x)					x			
B1			x	x		x		x	(x)	x	x
B2a	x							(x)	x		x
B2b			(x)	x		x				x	
B2c			x			x	x			(x)	
B3		(x)		x			x			x	
B4	x	x				(x)		[x]		x	x
B5		(x)	●			●	x	x	●	●	
C1	(x)		x	x	x	x	[x]	[x]	x		x
Data Collection Coordinating				●							
Study Progress Information							●				

Legend

(x): Study Segment Leader

x : Study Segment Participant

[x]: Study Segment Consultant

● : Coordinator

Time Schedules

The study completion date is December 1, 1971. The schedules for the individual study segments, beginning June 1, 1970, are as shown in Figure 1.

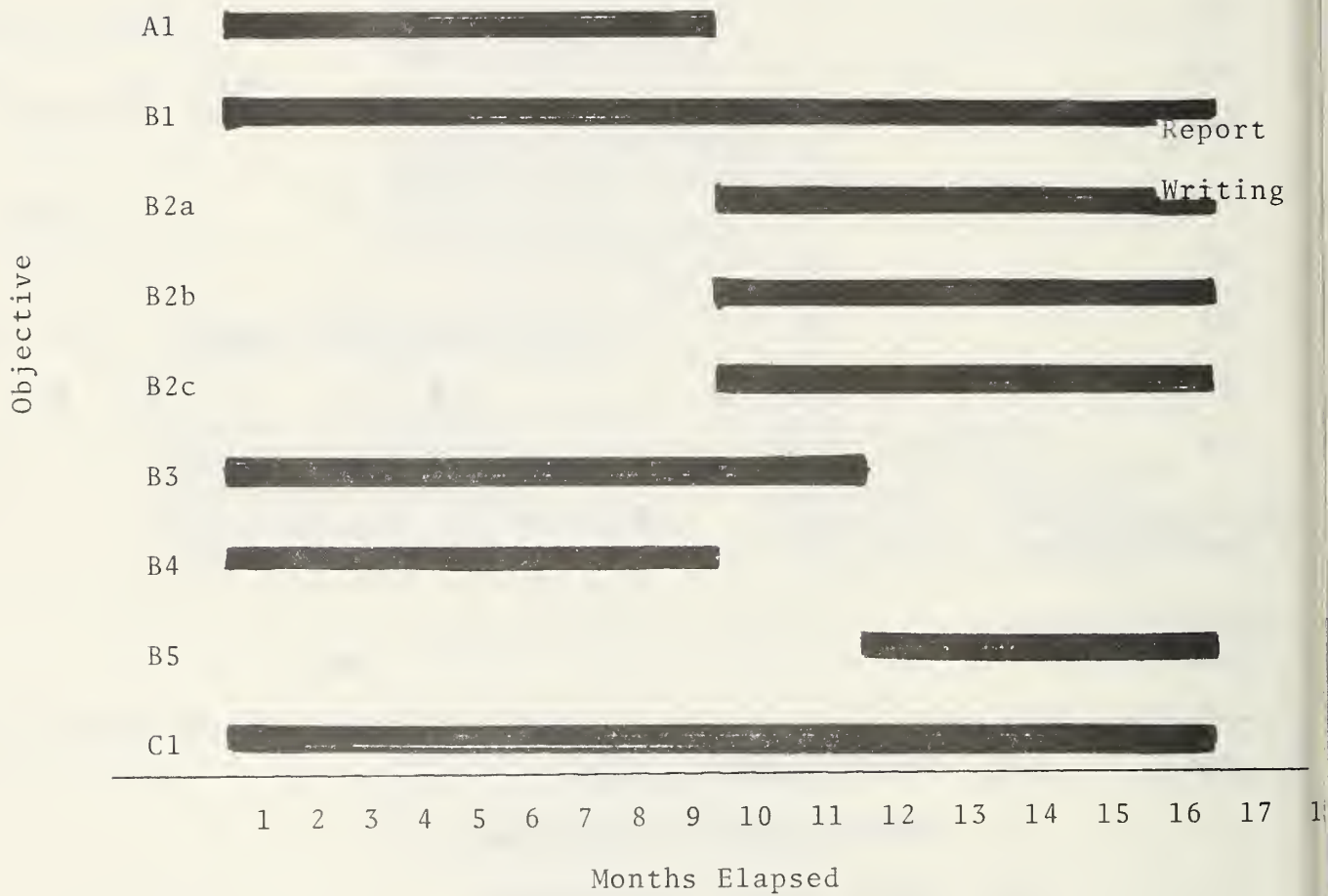


Fig. 1 Time schedules for the start and completion of individual study segments

Schedule of General Meetings

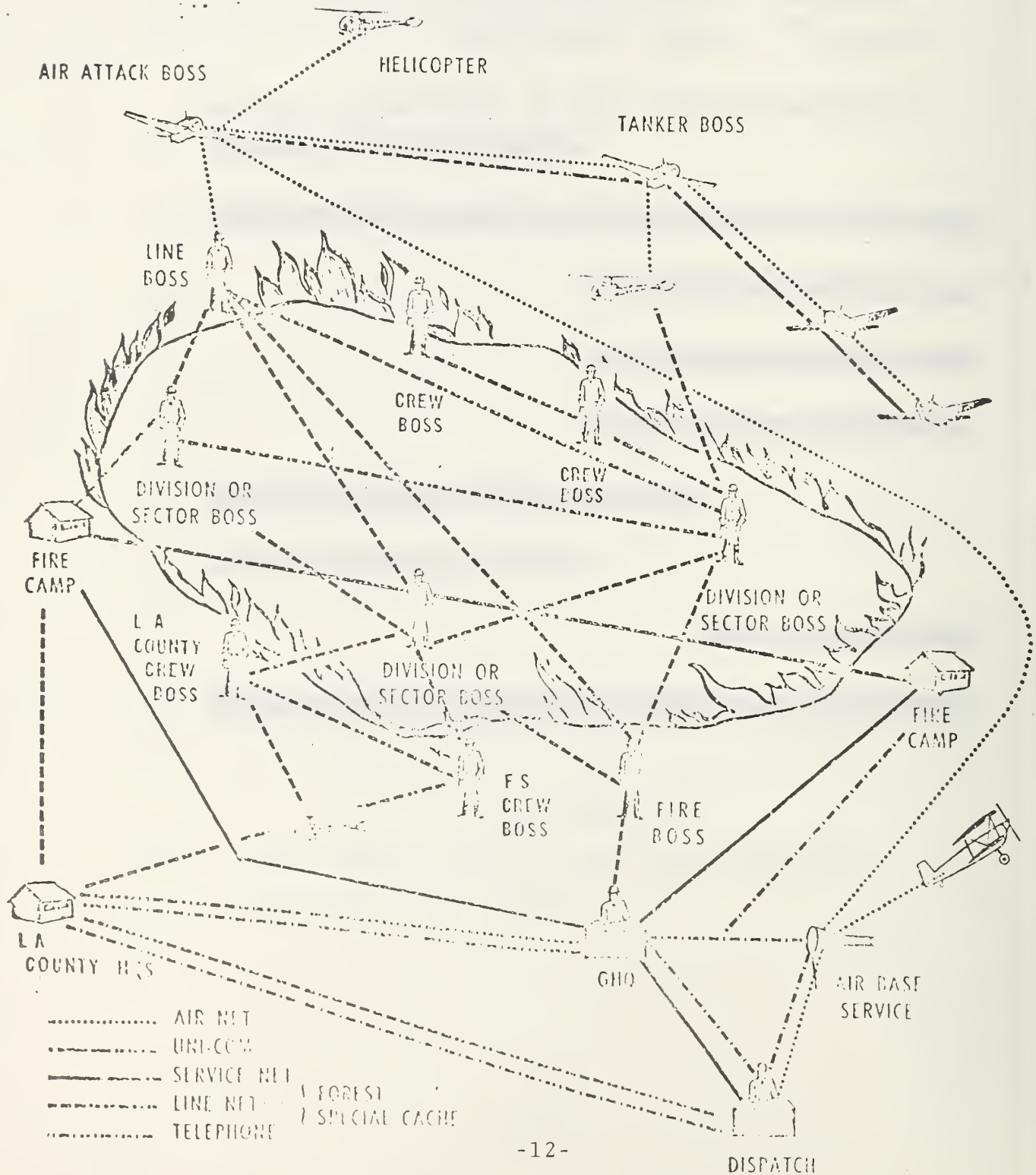
Berkeley March 9-16, 1970

Washington May 18-22, 1970

Denver Sept. 17-19, 1970

Additional meetings will be scheduled as necessary

COMMUNICATION NET ON FIRES



APPENDIX
Detailed Study Plans
for
Individual Study Objectives

Study Plan
Evaluation of Communication Requirements
(Objective B1)

Purpose

Provide methodologies for evaluating existing and future Forest Service communication requirements and the alternate means of satisfying them.

Study Outputs

A. Provide a structured framework for the presentation of communication requirements and for network and system re-evaluation. Define when such should be used.

B. Provide method for assessing gross gains and losses associated with the satisfaction or non-satisfaction of communication requirements, including non-fire radio use and safety considerations.

C. Provide method of evaluating alternate means of satisfying communication requirements on the basis of cost/benefit and operational considerations.

D. Provide handbook of network operating characteristics for a broad range of parameter values and provide guidelines for measuring network operating characteristics.

E. Provide "message flow" analysis procedures for systems as a whole with special attention to interfaces.

Specific Tasks in Support of Communications Requirements Evaluation

A. Establish the nature of the inter-relationships between point communication requirements and network and system characteristics.

B. Determine range of costs associated with radio communications, including:

Cost of equipment

Cost of maintenance

Cost of increased network congestion

Cost of loss of time due to unnecessary communications

C. Determine, on a small sample basis, the range of benefits associated with non-fire use of radio communications.

D. Devise methodologies for the evaluation of safety considerations in the justification of communication requirements.

E. Determine to what extent subjective gain and loss values associated with radio use can be utilized in the evaluation of communication requirements.

Methodologies and Data Sources

Whenever possible, existing methodologies from literature or other sources will be adapted for our purposes. However, it is foreseen that some developmental work will be required. The data sources for our work will come from the following sources:

A. Completed Forest Net Study

B. Concurrent large fire study data and responses to large fire communications requirement questionnaire

- C. Small sample study of non-fire benefits
from radio communications
- D. Historical contingency data of fire fatalities
and other events
- E. Field interviews

Study Plan

Standards for Operating Characteristics and Procedures

(Objective B2a)

Purpose

Develop and recommend standardization policies, guidelines, and specific standards for communication system operating characteristics and operational procedures.

Study Outputs

A. Define conditions for which levels of operational characteristics are to be established and determine these in terms of one or more of the following:

1. Average waiting times
2. Expected number of retrials
3. Probability of channel congestion

B. Provide additional guidelines, if necessary, for

1. Average length of call
2. Priorities of channel use
3. Information flow procedures
4. Transmission area coverage

C. Provide recommendations on

1. Standardization of operational procedures and codes
2. Operational procedures for congested channels
3. Strengthening of monitoring policy to assure proper radio use discipline

Methodology

Standards and guidelines for operating characteristics and procedures will be determined on the basis of

- A. Interpretation of observational data for present operations.
- B. Judgment and experience of Forest Service personnel
- C. Standards set by other agencies and industries, when applicable
- D. Federal Communication Commission studies.

Elements of Operational Procedures

A. Operational Use of Hardware

- 1. Simple maintenance
- 2. Use of basic hardware adjustments:
 - a. Squelch
 - b. Channel selector switches
 - c. Volume
- 3. Antennas
- 4. Speaking position for microphones
- 5. Basic records - log books, notes, forms

B. Formulation of messages

- 1. Brevity
- 2. Clarity
- 3. Codes
- 4. Voice practices
 - a. Rate of speaking
 - b. Address techniques
 - c. Delays in speaking to accomodate hardware

C. Coordination with other users

1. Priorities

2. Timing

D. Network, system monitoring practices

1. Assignment of responsibility

2. Delegation of authority

3. Commitment by monitor to obtain compliance

Study Plan
Equipment Standards
(Objective B2b)

Purpose

Develop and recommend standardization policies, guidelines, and/or specific standards when appropriate for replacement, maintenance, and installation of hardware and general hardware quality requirements.

Study Outputs

- A. Determine what factors affect failure rate
- B. Determine the relationship between these factors and failure rate.
- C. Recommend guidelines for use of the relationships in:
 - 1. Hardware specifications
 - 2. Maintenance schedules
 - 3. Replacement schedules

Methodology

The methodology will be almost entirely statistical. We will first gather data from each region about the factors that effect failure rates. We will then lot scatter diagrams of the data and make statistical determinations from this such as variance, function, coefficients, etc. With these diagrams we will determine what factors demonstrate a need for standards and also to which factors failure rate is sensitive. We would also like to make some fairly crude measurements of the

environmental factors that various classes of equipment are subjected; and determine what range of equipment specifications are needed. We also want to make determinations of tasks associated with changing the factors we find that are indeed important to failure rate. We will compare the cost of alternative methods of reducing rates.

Data Needed

A. In-Service

1. Failure rates by class of equipment
2. Maintenance budgets
3. Equipment inventories by class
4. Maintenance schedules
5. Workloads
6. Use rates
7. Maintenance records
8. Installation investment
9. Equipment age

We will conduct a pilot investigation in Region 4 the week of July 6. Data on the above will be collected. From this we will make conclusions about what form we wish to request the data from other regions.

B. Out-of-Service

1. Equipment life expectancy
2. Recommended maintenance schedules
3. Installation recommendations

Study Plan
Planning Procedure and Policy
(Objective B2c)

Purpose

Assess the effectiveness of current communication plans, planning policy, and procedures. If deficiencies are identified, recommend policy and procedures that will correct the deficiencies.

Assumptions

- A. Communication plans are needed.
- B. Communication plans are related to other plans.
- C. Forest Service and the communication organization will determine planning responsibilities.
- D. Cost and benefit analysis will be developed in A1.

Study Outputs

- A. Define the types of plans needed.
- B. Define who needs (uses) specific plans.
- C. Define the elements needed for each type of plan.
- D. Key out areas where policy is needed and is non-existent or needs improvement.
- E. Identify necessary elements of planning procedures to meet planning requirements.

Methodology

A. Examine FSM 7200 planning policy and design a checklist for measuring current compliance. Use this checklist to determine if current policy is being followed.

B. Examine at least the following current plans (D - Ranger District; F - National Forest; R - Region; N - National):

1. Communication Plans F, R
2. Frequency Management Plans R, N
3. Three-year Budgets R, N
4. Construction Plans F, R, N
5. Maintenance Budget Plans D, F, R, N
6. Functional Plans D, F, R

C. Examine current use of these plans.

1. Who uses them?
2. What elements are in plans and are needed?
3. What elements are in plans and are not needed?
4. What elements are not in plans but are needed?

D. Find out if the existing plans are considered adequate - inadequate by:

1. User interview
2. Review of activity inputs (other resources and/or improvement plans).

E. Evaluate ability of current policy and procedures to provide adequate plans based on information obtained in A - D.

F. Develop policy and procedures for communication planning.

G. Determine which alternative will meet the needs of the complete study.

H. Recommend best alternative.

Time Schedule and Assignments

A. Prepare policy checklist for national and R-4 policy. (Karl 8/1/70)

B. Go through methodology on a pilot Region. R-4 recommended as pilot. Select three sample forests (light, medium, heavy) and one Ranger District on each forest, and go through methodology Items A - F. (Bill, Tom, Karl 10/70)

C. If the need to collect more information is apparent, get it from R-8 and R-9. (Bill, Tom, Karl 1-2/71)

D. Complete methodology items G and H. (Bill, Tom, Karl 4/71)

E. Write final report. (Bill, Tom, Karl 5/71)

Study Plan
Financing of the Telecommunications System
(Objective B3)

Purpose of Sub-System Study

As a portion of the overall telecommunications study, this sub-system is designed to develop a process for identifying and obtaining the dollars needed to provide the men and equipment necessary for the construction and maintenance of the Forest Service Telecommunication System.

Objective

To provide the required talent, skills, knowledge, equipment, and services through the application of dollars.

Existing Situation

A. Forest Service now has an estimated investment of \$26,000,000 in Radio Systems and \$5,780,000 in telephone lines for a total of \$31,780,000.

B. Based on the latest available estimates, it will require about \$2,900,000 and \$275,000 annually to maintain the existing radio and telephone systems respectively.

C. Based on the latest estimates, it will require about \$2,480,000 and \$171,000 annually to replace components in the above Radio and Telephone systems. (10 yr. replacement on radio components)

D. The total of items B and C above is \$5,808,900 annually. (Does not include any "catching up")

E. For F.Y. 1971 we will be able to provide about \$1,884,000 to the R.O. level.

F. Construction not included in above.

G. Existing financial requests and procedures are not identifying and justifying the need for the dollars under item D and F.

Study Outputs

In conjunction with the on-going analysis of the Fire and General improvement activity by the Branch of Organization and work programs:

A. Determine the short range and long range financial levels required to maintain the telecommunications system to prescribed standards and written policy.

B. Define alternative methods of obtaining prescribed level of financing.

D. Recommend most suitable alternative.

Study Procedures (Proposed)

A. Determine How Done by Other Organizations

1. Are their telecommunication systems provided on an internal (in-house) or external basis (contract, etc.)

2. If provided externally - what are costs and benefits and possible sources of commercial service through purchase, lease, subscription, etc.
3. If provided internally - what are costs and benefit, and for Federal agencies, how are funds for telecommunication systems requested and justified to Congress.
4. Determine if methods used by other organizations be applicable to the Forest Service.

B. Investigate potential alternative methods of identifying and justifying telecommunication fund requests to Congress considering:

1. Should telecommunication fund requests continue to be included in fire and general improvements?
2. Should they be a separate line item?
3. Should they be multi-functionally financed from benefiting resource functions?
4. Are they part of general operating expense?
5. If fire and general improvement be placed in WCF - should telecommunications also be in WCF?
6. Other methods.

C. In conjunction with study of fire and general improvements, develop alternatives for internal allocation of funds among:

1. Administrative Units (Regions, Forests, etc.)
2. Among systems (air net, zone, etc.)
3. Between purchase and maintenance
4. Between construction and maintenance

Study Plan
Organizational Structure and Policies
(Objective B4)

Purpose

Recommends organizational structures and policies for the management, installation, maintenance, and operation of communication systems.

Engineering and maintenance organization alternatives.

Organizational ties and lines of communications with other parts of the Forest Service organization.

Recruitment and training.

Study Outputs

A. Provide organizational structure alternatives for adequate management, installation, maintenance, and operation of telecommunication systems, considering:

1. Tasks
2. Structure
3. Processes
4. People
5. Objective

B. Provide organizational recommendations, based on evaluation of alternatives.

C. Provide recommendation for electronic engineer and technician recruitment and development (training).

D. Provide recommendations for training of others in the management and operation of telecommunication systems.

Study Methodology and Procedures

A. Develop a model of operation for the telecommunication organization according to these four task areas:

1. Objective setting
 - a. Standards
 - b. Criteria
 - c. Processes
 - d. Guidelines
 - e. Methods
2. Determining System Requirements
 - a. Requirements for communication
 - b. Desired characteristics
 - c. Project design
3. Designing System Specifications
 - a. System engineering
 - b. Hardware
 - c. Operation
4. Operating Systems
 - a. Procurement
 - b. Installation
 - c. Maintenance
 - d. Replacement
 - e. Discipline

5. Other contributions to Forest Service objectives
 - a. Outside contacts
 - b. Negotiations
- B. Within model, examine relationships between telecommunication group and rest of Forest Service organization
 1. Tasks (Objectives)
 2. Processes (Technology)
 3. People (Motivations)
 4. Structure (Authority, Communication)
- C. Develop outputs (intermediate and final) which may be evaluated, considering efficiency and effectiveness criteria
- D. Develop criteria for evaluating performance
 1. Beneficial characteristics
 2. Efficiency
 3. Effectiveness
- E. Modify model and assumptions according to:
 1. Investigation
 2. Other study parts
- F. Evaluate alternatives of organization, as generated, according to costs, ease, and other constraints
- G. Provide, for final report, recommendations and policies for:
 1. Organization alternatives
 2. Organizational ties and communications

3. Recruitment and training
4. Methods of evaluating performance of the telecommunications organization

Data Needs and Gathering Procedures

A. General Considerations

1. Nation-wide
2. All levels and areas must be sampled
3. Must correlate with other study segments
4. Depth of study depends upon time and manpower limitations
5. Breadth of study depends upon sensitivity of benefits to organizational factors of structure, people, systems. This will be determined from initial data analysis by study team, concerned persons, and expert consultation.

B. Type and Purpose of Information Inputs

1. Existing requirements and procedures
 - a. Management policies
 - b. Management processes
 - c. Personnel
2. Managerial Data
 - a. Responsibilities
 - b. Authorities
 - c. Control
 - d. Work assignments

- e. Workloads
 - f. Direction
 - g. Assistance
 - h. Financing
 - i. Others
3. Motivational Data
- a. Incentives
 - b. Career opportunities
 - c. Involvement
 - d. Placement
 - e. Training
 - f. Others
4. Knowledge and Skills Data
- a. Scientific and Technical
 - b. Consulting
 - c. Designing
 - d. Operating
 - e. Evaluating
 - f. Training
 - g. Other
5. Production Data
- a. Networks
 - b. Outputs
 - c. Designs
 - d. Installation
 - e. Maintenance

- f. Replacement
- 6. Effectiveness Data
 - a. Information exchange
 - b. User satisfaction
- 7. Economic Data
 - a. Staffing
 - b. Gains
 - c. Losses

C. Data Sources

Sources will be Manuals, Handbooks, with samples of all levels. Also, selected Communications, Personnel, Operation, Fire Control, Administrative people in W. O. and R.O's. Will collect from others as progress dictates. Questionnaires and interview outlines will be developed and tested in Regions 4, 8, 9, with two or three sample forests included in each. Additional data will be collected from sample units as determined. Cost data will be furnished by the Electronics Group (W.O., R.O.). Pertinent methods and standards generated by other parts of the study will be obtained. Our requirements will be communicated to the other teams concurrent with progress, and vice-versa.

Various personnel studies, recently completed for the Forest Service may provide information on behavior.

D. Time Schedule

- | | |
|--|------|
| 1. Gather FSM, FSH from all Regions | 7/70 |
| 2. Develop Methodology for Data
Collection, Pilot Region, R-4 | 6/70 |
| 3. Data Collection, R-8,9 | 9/70 |
| 4. Complete Data Collection | 3/71 |
| 5. Report | 5/71 |

Study Plan
Management System for Forest
Service Telecommunications
- A Proposed Process
(Objective B5)

Purpose of System

To take the outputs of the telecommunication study, and develop these elements into a management system or process that currently updates the Planning, Organizaing, Staffing, Directing, Coordinating, Reporting, and Budgeting for the Forest Service Telecommunications Activity.

Objective

To provide a Revised Management System for Forest Service Telecommunications.

Existing Situation

Symptoms

The existing policy for management of telecommunications does not provide:

A. A sufficient data base for current updating of telecommunication needs and requirements.

B. Any recognition of the level of degree to which radio communications should be provided for the safety of field personnel or for the general public.

C. Any recognition of the volume or complexity of administrative radio traffic or an anlytical procedure for determining potential costs and/or benefits of administrative traffic at the SO and Ranger District levels.

D. Any ties or crosswalks with the pending implementation of the INFORM, ADP, and New Accounting Systems.

Study Process

A. The Service-wide Telecommunications Study has been broken down into the following segments for study purposes:

Technological Survey

Requirements

Operations

Hardware

Planning

Financial

Organization

Management System

Large Fire Communications

B. As plans for gathering further data for the above study portions are developed, they should be monitored to see that the data to be collected includes recognizable inputs into a future management system.

C. In addition, specific and specialized data in the following areas should be collected, if possible, and analyzed to obtain:

1. The cost-benefit relationships of commercial telephones and radios used at the SO and District levels for comparative purposes.

2. The degree to which radios should be provided to field-going SO and Ranger District personnel for law enforcement purposes, and for the safety of employees as well as the general public.
3. A measure of the relative importance of administrative radio traffic and to what extent it can be justified on a cost-benefit basis in addition to fire traffic.

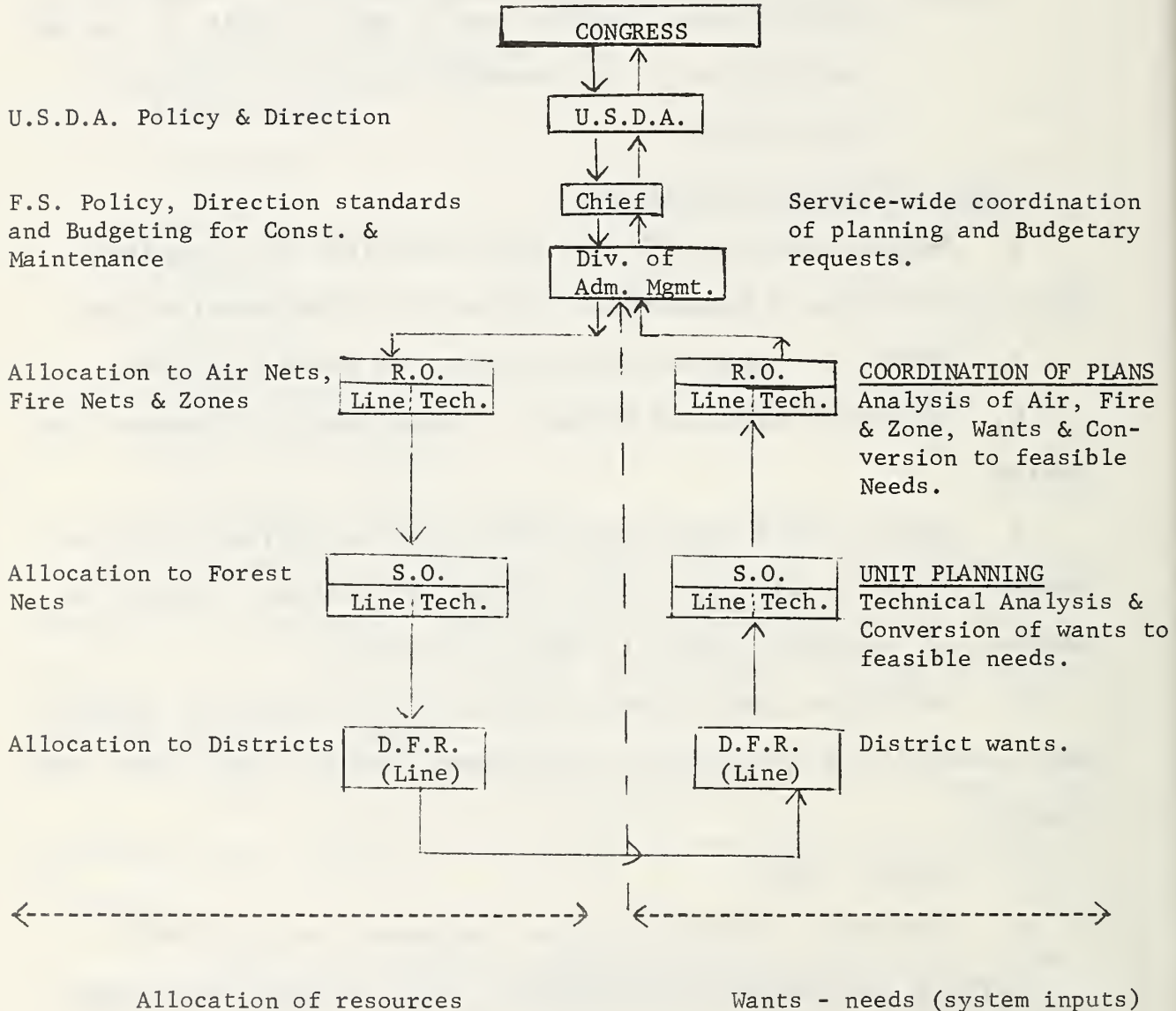
Study Procedures (Proposed)

- A. Review existing FSM and FSH Directives for completeness in providing a Management System for Telecommunications.
- B. Determine apparent deficiencies in present system.
- C. Determine type and volume of data needed to update the system.
- D. Monitor data collection that will be derived from subsystem. Studies as inputs into management system. Modify as needed, if feasible, prior to data collection.
- E. Determine, and collect additional and specific management system data as needed to supplement inputs from other sub-studies.
- F. Analyze Data
- G. Determine alternatives and recommend most suitable.

Develop Recommended Alternatives Into Proposed Management System

(See attached schematic design for proposed approach)

SCHEMATIC OUTLINE OF
PROPOSED MANAGEMENT SYSTEM FOR
TELECOMMUNICATIONS



Study Plan
Large Fire Communications Study
(Objective C1)

Purpose

Provide solutions to general communication problems related to large fires, with special focus on:

Intra-sector communications,
Air-attack communications,
Service function communications.

For the purpose of this study, a large fire is defined as a fire requiring a multi-sector suppression organization.

Study Outputs

A. Provide general design recommendations for adequate intra-sector, air attack, and service function communications (tailored to functional needs but not to specific organizational units).

B. Provide evaluation of design alternatives based on cost and operational factors.

C. Provide descriptive operational characteristics of present systems and, in the case of intra-sector communications, a proposed system.

D. Provide analyses of communication situations associated with fire fatalities based on historical records.

E. Provide organizational change recommendations.

F. Provide training recommendations in communications, if appropriate.

Study Methodology and Procedures

The starting point in our study of the large fire communications system will be provided by detailed statements of communication requirements from users. These will be evaluated in the light of observational data collected on large fires by procedures of part B1, if such become available and are applicable, and by other applicable procedures.

The interpretation of observational data and formulation of recommendations will in turn reflect the somewhat subjective post-fire information given by selected fire suppression personnel. In all phases of the study, proper weight will be given to non-objective inputs.

Information from our field data will be used to provide a basis for future specifications of requirements. This information would also provide the input for the development of a large fire computer based communications simulator.

Data Needs and Data Gathering Procedures

A. General Considerations

The data gathering procedures for this study are based on the following considerations:

1. Need for a broad data base covering most aspects of large fire communications.

2. Need to correlate local fire conditions with communications traffic.

3. Variability of fire conditions and variability in the use of communications facilities.

4. Need to ascertain fully, and to evaluate, fire management requirements for large fire communication needs.

5. Difficulty of processing communications data and the time and manpower limitations on the study.

B. Type and Purpose of Information Inputs

The study will utilize three categories of input information:

1. Fire Control Specifications of:

Point communication requirements

Operational network and system performance requirements

2. Field fire and communications data (including experimentally produced data) on as many as possible of the following variables:

Total network utilization

Frequency of calls

Length of calls

Type of links (where did call go)

Success or failure of calls

Waiting times

Retrial rates

Content and use of codes

Local fire situation

Quality of transmission

Specific communication insufficiencies and failures

General communication situation for specific periods

Interface requirement

Special problems

3. Economic data concerning:

Gains due to improved tactical operations due to communications

Loss factors due to communication failures

Hardware and other cost factors

Loss and gain should include, besides the more obvious items, the factor of timely intervention (or the lack of it), and the consequent additional cost of fire suppression ascribable to communications.

C. Data Sources

1. Fire Communication Requirements Specifications

The source for such specifications will be the regional Fire Control Division personnel, primarily the Fire Control Officer, Aerial Activities Officer, the Regional Dispatcher, and/or line personnel on the monitored large fires. Others who may have special competence in the fire communications area may contribute at the discretion of the Regional Fire Control Division Chief.

2. Field Data

If the fire situation provides the opportunity, our study procedure requires interviewing and monitoring of

one multi-sector fire in each western region. Monitoring more than one fire per region may be required if:

- a. Very few regions experience a large fire, or
- b. Special fire situations develop (i.e., operations, communication patterns), which may be of potential interest in communications design.

3. Economic Data

To the extent possible, gain and loss data will be gathered together with information on Fire Control specifications of communications requirements and with the interview phase of the gathering of field data. Equipment cost data will be provided by the Electronics Branch of the Forest Service.

D. Methods of Field Data Collection

1. Service function

Information on this function will be obtained by a study team monitor with this specific assignment, on location, during large fires. An additional source of information will be post shift/post fire interviews with the Service Chief, Supply Officer, and fire camp radio operator. The study team on the fire will be responsible for providing exact background information on the methods of transmitting service requests (i.e., telephone, radio, both, other, etc.). Available written records of service orders will also be used to evaluate the

amount and nature of service function communication demands. This is potentially a very important source of information. Telephone billings for dates of fire are another source of information.

When necessary (no recording at dispatcher's office) or desirable, one channel of a two channel tape recorder is available for independent recording of service channels by study personnel.

2. Air-attack Communications

a. The utilization of the air net will be recorded by a chart recording device located at some elevated point. Simultaneously, one channel of a 2-channel tape recorder will make recordings of the actual communications for later sub-sampling.

b. Line net air attack communications will be obtained from the analysis of tape recordings of all line net communications. A second channel of the two-channel tape recorder will be used for this purpose. For the monitoring of air attack traffic (mostly from the line boss), only daylight hours require monitoring.

c. Post shift/post fire interviews should include:

- (1) Zone air operations dispatcher
- (2) Air attack boss
- (3) Air tanker boss
- (4) Line boss

The zone air dispatcher would provide information on the larger air operations framework and problems of coordination.

3. Intra-sector Communications

High power personal portable receivers/transmitters operating on the C.B. frequency range, will be provided to the personnel on a selected fire sector. Personnel assigned this equipment will be squad bosses, crew bosses, tanker bosses, firing boss, scout, sector boss. Intra-sector and line net communications will be monitored on the channels of the 2-channel portable tape recorder and, simultaneously, the communications of the sector boss on the line net will be monitored by an observer with the use of logs. Monitoring can be intermittent, but the important build-up and busy phases should be included. Post shift/post fire interviews with the sector boss and other users of the intra-sector communications facilities will provide additional information on the potential value of this communication link.

E. Time of Monitoring

If possible, all monitoring activities should be completed during the 1970 season. However, regions with early spring fire seasons could be monitored during the early 1971 fire season.

All fires should be reached during the build-up stage of the fire organization. It is estimated that the monitoring teams should reach a fire within six hours of notification in Region 5 and within twelve hours after notification in

Regions 3 and 6.

Monitoring activities should extend into the early mop-up stage of fire suppression.

F. Action Plan for Gathering Field Data

1. Notification and Orientation

a. Washington Office will notify Regions of study team orientation visits and will request attendance at the meeting by:

- (1) Chief of Fire Control
- (2) Branch Chief - Suppression
- (3) Regional Dispatcher
- (4) Electronics Engineer
- (5) Other F. C. personnel

b. Visit to Regional Offices during first two weeks in June (Possibly R-3 in May) by:

Jack Carter & Gideon Schwarzbart	- R-5
Jack Carter & Tom Hensley	- R-1 & R-6
Jack Carter & Bill Kennedy	- R-3
Jack Carter & Miles Hill	- R-2
Karl Spelman & Miles Hill	- R-4

to:

(1) Explain Communication Study and gain acceptance of monitoring plan.

(2) Arrange fire notification procedures with Dispatcher.

(3) Furnish regions sample letter to forests informing them of study to be made on large fires.

(4) Inform engineers about specific hardware and supply requirements.

2. Fire Communications Monitoring Activities

Assignments

a. Team dispatch responsibilities

(1) Jack Carter

(2) Robert Carlson

b. Monitoring team leaders:

(1) Regions 1,5, & 6 - Jack Carter

(2) Regions 2 & 4 - Miles Hill

(3) Region 3 - Bill Kennedy

c. Monitoring Team Members and their assignments

Team leader (depending on Region): Coordinator

Tom Hensley - Monitor #1

One team leader with responsibilities for another Region - Monitor #2

Gideon Schwarzbart or Ernst Valfer - Monitor #3

Jim Jay - Monitor #4

d. The monitoring team will depart by fastest means available for the fire as soon as possible after being notified of the fire, and after ascertaining that the right situation appears to be developing. All team members away from

duty station will designate substitutes.

3. Monitoring equipment

a. The monitoring equipment cache will be located in Berkeley at a place accessible at all hours of day or night, beginning June 10, 1970.

b. Portable radios requested from the field will be the responsibility of the electronics technician on the fire.

4. Monitoring Tasks

#1 Monitor: Air net and line net monitoring at elevated point. Will service monitoring equipment and log times of air attack traffic on line net.

Equipment: 1 tape recorder, 1 chart recorder,
2 portable receivers (air-net, line-net),
1 clip board

#2 Monitor: Monitors Sector Boss communications with clip board and stop watch. Monitors communications, traffic flow patterns, and sector fire conditions.

#3 Monitor: Monitors intra-sector and sector line-net communications.

Equipment: Tape recorder and two portable receivers (intra-sector, line-net). Monitor must stay close to sector.

#4 Monitor: Service function traffic monitoring. All service communications, by whatever means, should be included in the monitoring activity.

Equipment: Tape recorder, clip board.

Decides when (which shift) to monitor. Collects shift plans. Provides narrative fire report (see Item 6) and overview of traffic flow, communications equipment on fire.

5. Coordinators Narrative Report

a. Fire environment

Terrain; safety; strategy; number of people and equipment (all types; location of various facilities, such as camps, air bases, heliports, weather facilities, rest areas, staging areas; other cooperating agencies; GHQ; dispatchers' offices, etc.).

b. Special problems - transportation, supply, day by day summary of events.

(1) Communication equipment used and in reserve

(2) Maps - fire, area (forest, zone, etc.)

(3) Shift records - assignments

(4) Photos

6. Post Shift Interview Responsibilities

#1 Monitor: Communications Officer

Electronics Technician

#2 Monitor: Sector Boss and other sector personnel

#4 Monitor: Service Chief, Supply Officer, radio operator, and other service personnel

Coordinator: Fire Boss, day and night line bosses
(chiefly those responsible for monitored sector), air attack boss, air tanker boss, zone air operations dispatcher

7. Dispatch Procedure

a. Regional responsibility (Region in which fire is developing).

(1) Recognize that this is fire which should be sampled (or that is not) - in other words the dispatcher must keep us in mind.

(2) Call Team Dispatcher or R-5 dispatcher; give the following information:

(a) Fire name

(b) Fire location: legal, general

(c) Narrative account of situation, estimate of time to control, estimate of complexity of operations

(d) Local transportation for team (probable arrangements), including what we may need while on the fire

b. Dispatcher call Team Leader for Region concerned on go or no-go decision

c. Team Leader

(1) Call all team members or alternates (or arrange for a Management Science team member to call some people)

- (2) Arrange transportation - plane
- (3) Call Region back and give:
 - (a) Whether we are coming or not
 - (b) ETA and number of people coming
(with names)
 - (c) Firm ground transportation to fire
- (4) Notify Tom Hensley of fire
- (5) Keep coordinator informed of whereabouts

d. Team Members

- (1) Keep coordinator informed of location and

give:

- (a) Phone number
- (b) Any periods of time when not available for assignment
- (c) Be ready to roll

(2) Berkeley based persons - either Hill, Schwarzbart, or Kennedy - be prepared to pickup hardware. Call every Friday and give Coordinator ready list for weekend. (Any other procedure which must be followed at any given time must be pre-arranged with Carter, Schwarzbart, etc., so that there will be no problem in getting the equipment to the airport.)

Equipment Needs for Field Data Gathering

1. Not available in Regions at present:

- a. Personal portable receivers-transmitters (12)

- b. Portable receivers for air, line-net (3)
- c. Two-channel tape recorders, portable (3)
- d. Power sources (batteries)
- e. Stop watches (8)
- f. Clipboards (8)

2. Available in Regions

- a. Local transportation equipment

Time Schedule

- | | |
|------------------|--|
| June 10, 1970 | - Have field questionnaires and equipment ready for use and complete field visits |
| October 30, 1970 | - Have all large fire data collected, with the possible exception of Region 3. This includes monitor data and responses to large fire communication requirements questionnaire |
| June 30, 1971 | - Finish analysis of all data |
| October 1, 1971 | - First draft of report |
| November 1971 | - Final report out |

U.S. FOREST SERVICE COMMUNICATIONS STUDY

10/21/68

1. JUSTIFICATION FOR THE STUDY

- A. The Forest Service has approximately 21 million dollars capital investment plus 3 million annually for replacement and maintenance in communications systems. Management needs complete basic information on this system in order to manage effectively.
- B. Several regions have initiated regional studies directed toward one or more of its communications problems.
- C. An objective basis is needed for long range planning including economics and feasibility of implementation.
- D. Recently expressed dissatisfaction of users and fire analysis studies indicate problems in the communications program of the following nature:
 - (1) There are weaknesses in our present method for objectively evaluating communications requirements.
 - (2) The present procedure for system planning is weakened by lack of adequate system standards.

- (3) There are recruitment and training problems in technical service staff. (Five of the professional engineers will retire within 5 years. Only one out of five junior engineers recruited has been retained).
- (4) There appears to be a lack of information exchange between line management technical services, functional staff and other users about communications.

2. SCOPE OF COMMUNICATIONS STUDY

The study should consider all telecommunications which the Forest Service now uses or might use to accomplish any present or projected Forest Service and cooperative programs.

3. OBJECTIVES OF THE STUDY

- A. Develop a procedure for determining and analyzing communications requirements and analyzing cost-benefit of alternative systems. Such a procedure would be used in the initial analysis of basic communication requirements of the Forest Service, and also become the tool for communication planning for each Forest Service system or network.
- B. Analyze and identify the basic communication requirements of present and projected

Forest Service programs. This analysis would become the basis for standards for communications system planning.

- C. Identify and evaluate the alternative combinations of communications media and equipment which could be used to satisfy these requirements in the various communications systems of each Unit, Region, Station and servicewide.
- D. Prepare a long-range national plan for insuring that present and future requirements for communications will be met.

4. SUGGESTED APPROACH

- A. Make problem analysis.
 - (1) Review and analyze the results of past and on-going studies including relating non-Forest Service studies.
 - (2) Review present communications policy and objectives.
 - (3) Examine current procedures for determining communication requirements.
- B. Identify and describe communications requirements, including standards to be met for the following:

Basic administrative needs of National Forest System; Research Communication

requirements; S&PF communication requirements; wartime defense communication requirements; special functional requirements such as, fire, aircraft or other special localized requirements of each Region; and common nation-wide communications requirements.

- C. Assess present capability to meet above requirements. Examine strengths and weaknesses of Regional and Forest plans and planning methods.
- D. Identify problems and opportunities that if solved or exploited would improve the economy and effectiveness of communication.
 - (1) Identify problems or opportunities to be dealt with in this study.
 - (2) Identify problems or opportunities to be handled in later studies or research.
 - (3) Study organizational alternatives for communications.
 - (4) Assess current operating procedures and practices.
- E. Identify, assess and describe the optimum alternatives to meet present and projected communications requirements.

- (1) Develop alternative combinations of equipment, media and channels through cost-benefit analyses. Select the optimum arrangements.
- F. Prepare plan to implement, to include the following: time phasing; amount and types of equipment on installations; costs and financing plan including separation of capital investments and maintenance; economic justification showing output in quantative terms.

5. ORGANIZATION

- A. The study will be conducted by a Forest Service Study Group. The following representation is suggested:

Project Leader	McNaughton, WO
Representative of Fire Control	(to be selected)
Representatives of Communications	Morton, WO
Communications	Hensley, R-2
Representative of other FS Programs	(to be selected)
Management Sciences Staff	Gideon Schwarzbart as team member, with Ernst Valfer as consultant.

- B. The study group may recommend contracting any portion of the study whenever such action appears necessary to accomplish the study objectives.
- C. The study group will report to and be guided by the Director, Division of Administrative Management.
- D. The members of the study group should be prepared to spend full time on the study as necessary during CY 1969. The goal will be to carry the study to completion by December 31, 1969.
- E. The study group will work from the Washington Office. Funding, including travel, will be arranged by the Division of Administrative Management.

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